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ABSTRACT

Acceptance of a paradigm in the scientific community depends upon persuasion, upon the supplying of "good reasons" for supporting one paradigm over another. When one paradigm gains long-term acceptance and becomes the standard for scientific thought, scientists defer to such an authority in their thinking, and such established paradigms serve to guide the practice of science. Consequently, when in the course of a scientific revolution a new paradigm is offered as a challenge to old standards of thinking, the burden of proof is on the challenger, who must now prove good reasons for the shift based on principles of argumentation. Before scientific revolutions occur, an established paradigm has presumption over all challenging theoretical frameworks until sufficient proof is adduced against it. Scientists help to entrench such frameworks by specialized vocabulary and skills which narrow their vision and increase their resistance to change. Paradigms that challenge existing thought, unless they can be accommodated by the old framework, will meet resistance from researchers whose work is grounded in the established paradigm and students who traditionally defer to authority. Once a paradigm has successfully challenged an older framework, it will continue to be regarded as a counter-presumption until it, too, becomes the norm and no longer must defend itself. (References are included.) (JC)

PARADIGMATIC AND PRESUMPTIVE SHIFTS:

THOMAS KUHN AND RICHARD WHATELY IN TANDEM

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Paradigmatic and Presumptive Shifts:

Thomas Kuhn and Richard Whately In Tandem

Man (and more recently, woman) has been intrigued by the search for 'Truth' for generations. This search has been undertaken in the name of science, religion, society, and other rubrics; but regardless of the field in which the search takes place, every seeker of the Truth relies on their own convictions and on their abilities to affect the understanding (and therefore influence the will) of others in convincing them to adopt a particular version of the Truth.

In the field of science, for instance, researchers are concerned with developing paradigms which account for Truth by empirically testing hypotheses and theories. Once a paradigm has been developed, it is up to the scientists responsible for the discovery to convince their contemporaries that they ought to adopt the new approach. Thus, "to understand why science develops as it does, . . . one must understand . . . the manner in which a particular set of shared values interacts with the particular experiences shared by a community of specialists to ensure that most members of the group will ultimately find one set

of arguments rather than another decisive. That process is persuasion. . . ."[1] As Thomas Kuhn describes it, then, scientific development is inextricably linked with persuasion, to the extent that the collective understanding of the community of scientists must be influenced in order for them to accept a given scientific paradigm.

Acceptance of a paradigm necessarily depends on supplying enough "good reasons" or arguments to persuade a given scientific community. Kuhn indicates that "as argument piles on argument and as challenge after challenge is successfully met, only blind stubbornness can at the end account for continued resistance."[2] It is clear, then, that the conduct of science depends in some measure on "the art of 'reasoned discourse,'"[3] as Richard Whately puts it.

Such an observation may appear common-sensical, and in fact a few authors in the field of Speech Communication have written about the uses of argument in scientific disputes. But none of these authors that I am aware of has probed the relationship between argumentation and paradigmatic shifts. Accordingly, this paper will investigate the parallels between Thomas Kuhn's notion of scientific revolution and Richard Whately's conceptualization of presumption and burden of proof. It is the thesis of this essay that principles of argumentation can account for what happens during scientific revolutions. This paper, therefore, will

examine scientific paradigms before, during and after they shift, in relation to presumption and burden of proof.

Before Paradigmatic Shift

In order to understand what happens during a scientific revolution, it is imperative to first comprehend what science is like in its normal state. Kuhn defines 'normal science' as "research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice."[4] The conduct of scientific affairs on a day-to-day basis, with reliance on past scientific achievements, ther, constitutes normal science.

But scientific investigation goes further than that; necesssarily, certain scientific achievements cluster together to form theoretical frameworks which can be tested and expanded as part of the empirical nature of the field. Such theoretical frameworks are called paradigms. Kuhn explains this concept: "'[P]aradigms' . . . suggest that some accepted examples of actual scientific practice . . . provide models from which spring particular coherent traditions of scientific research."[5] The development and continuation of a particular research tradition underpins the conduct of normal science. In other words, paradigms guide the practice of science. As Kuhn makes clear, "[m]en

whose research is based on shared paradigms are committed to the same rules and standards for scientific practice. That commitment and the apparent consensus it produces are prerequisites for normal science. . . .6

The logical outgrowth of identical rules and standards for scientific practice is the systemization of the conduct of scientific investigation. The practitioners of the field, in their quest to articulate the promise of the paradigm, call for "the construction of elaborate equipment, the development of an esoteric vocabulary and skills, and a refinement of concepts that increasingly lessens their resemblance to their usually common-sense prototypes."7 In essence, the scientists develop their paradigms so as to entrench their position in the scientific milieu. The use of specialized equipment and language serves to create a 'professionalization' which leads "to an immense restriction of the scientist's vision and to a considerable resistance to paradigm change."8

Once this professionalization takes place, it does two things: (1) it guides the practice of normal science, and (2) it insures that the paradigm will retain its status unless and until it is severely challenged.

The primacy of the paradigm as guaranteed by the conduct of normal science demonstrates the principle of argumentation advanced by Richard Whately know as "presumption." Whately explains the concept in this way:

> According to the most correct use of the term, a "Presumption" in favour of any supposition, means, not (as has been sometimes erroneously imagined) a preponderance of probability in its favour, but, such a pre-occupation of the ground, as implies that it must stand good till some sufficient reason is adduced against it; in short, that the Burden of proof lies on the side of him who would dispute it.9

In relation to Kuhn's precepts, then, normal science and the paradigms which are tested and extended in its practice, necessarily have presumption. If attacked, they occupy the figurative ground and will reign supreme unless compelling arguments are leveled against them. The burden of proving that the paradigm(s) ought to be rejected rests with the attackers. They must prove that there is sufficient reason to abandon present practices and change to new methods of pursuing normal science. In essence, these attackers argue for the abandonment of current professionalization so as to adopt a new paradigm which will result in a different brand of professionalization.

But this abandonment will not happen unless the attackers can overcome the specific presumptive ground occupied by the paradigm in place. In other words, according to Whately, there are different types of presumption which can be operative in a controversy. The attacker (or, more properly, the advocate in the argument) must suspend the specific type of presumption in operation if he or she is to gain adherents to the new position.

The two types of presumption which are most applicable to this stage of scientific controversy (i. e., before a paradigmatic shift) are (1) presumption in favor of existing institutions and (2) presumption against a paradox. Whately describes these two conditions as follows:

> There is a Presumption in favour of every existing institution. Many of these (we will suppose, the majority) may be susceptible of alteration for the better; but still the "Burden of proof" lies with him who proposes an alteration; simply, on the ground that since a change is not a good in itself, he who demands a change should show cause for it. No one is called on (though he may find it advisable) to defend an existing institution, till some argument is adduced against it 10

> There is a "Presumption" against any thing paradoxical, i. e. contrary to the prevailing opinion: it may be true; but the Burden of proof lies with him who maintains it; since men are not to be expected to abandon the prevailing belief till some reason is shown.11

In the first case, the professionalization brought about by adherence to a particular paradigm acts as the existing institution which has presumption. The community engaged in normal scientific research thus does not have to defend the institution to which they belong until compelling arguments are leveled against it.

In the second case, the prevailing opinion is obviously the paradigm itself. If an advocate suggests the adoption of a belief which is contrary to the paradigm, it will be viewed as paradoxical. Presumption therefore rests with the

paradigm until the advocate meets the burden to prove that a viewpoint contrary to the paradigm ought to supercede it.

When the advocates in a paradigm controversy attempt to meet their burden of proof and overcome presumption, the process of scientific revolution intensifies.

During Paradigmatic Shift

In the conduct of normal science, paradigms are guides to research. They don't change appreciably unless something new and previously unheard of cannot be assimilated into their basic structure. In other words, paradigms can often accomodate new findings which adhere to the basic thesis of the research tradition which spawns them. But anomalies of fact or theory sometimes cannot be assimilated into the dominant paradigm. When this happens, "[n]ormal science . . . often suppresses fundamental novelties because they are necessarily subversive of its basic commitments. Nevertheless, so long as those commitments retain an element of the arbitrary, the very nature of normal research ensures that novelty shall not be suppressed for very long.12

When a scientist operating under the parameters of a given paradigm uncovers a novelty of fact or theory, the scientific community regards the discovery with some disdain. The scientist, too, experiences a certain degree of censure, which Whately recognized as "an obvious danger of a man's being regarded as a dangerous experimentalist who

adopts any novelty. . . ."[13] But if the novelty is significant enough to persist and important enough to affect the paradigm, "either the paradigm broadens its scope to include these anomalies hitherto considered outside of the purview of the paradigm, or a radical paradigm shift will occur."[14]

Still, it is not easy to get the scientific community to recognize an anomaly and to shift paradigms. This is largely due to the concept of presumption advanced earlier. The adherence to existing institutions breeds a sense of complacency which is difficult to disturb. Furthermore, since science is a relatively closed community (scientists train and teach scientists), the thoughts and practices of this homogeneous group support the status quo and largely reject novel ideas. As a result, a presumptive deference in favor of the authority is manifest in the scientific community. Kuhn's concept of novelty and its resistance by a community of scientists can therefore be accounted for by examining Whately's notion of deference.

Richard Whately defines deference in this way:

> The person, Body, or book, in favour of whose decisions there is a certain Presumption, is said to have, so far, "Authority"; in the strict sense of the word. And a recognition of this kind of Authority,--an habitual Presumption in favour of such a one's decisions or opinions--is usually called "Deference."[15]

The recognition of authority in the study of science is quite pronounced. Kuhn explains that "science students accept theories on the authority of teacher and text, not because of evidence. What alternatives have they, or what competence? The applications given in texts are not there as evidence but because learning them is part of learning the paradigm at the base of current practice."[16] So, according to Kuhn, students of science rely on their teachers and texts as the final authority in learning their field. To do otherwise would be virtually impossible given the constraints which govern the practice of science. Since "[t]he study of paradigms . . . is what mainly prepares the student for membership in the particular scientific community with which he will later practice," and since "he there joins men who learned the bases of their field from the same concrete models," it is not surprising that "his subsequent practice will seldom evoke overt disagreement over fundamentals."[17] This is because these students tend habitually to defer to their teachers and texts.

Deference is virtually ingrained into the system of scientific learning. Such training "is not well designed to produce the man who will easily discover a fresh approach."[18] The conformity spawned by scientific training discourages the pursuit of novelty, and thus the system of science maintains itself within certain dominant paradigms.

Every once in a while, however, as was noted previously, certain anomalies surface in a paradigm which cannot be assimilated into its theoretical framework. These anomalies give rise to the creation of a new paradigm. But it is interesting to note that it is rarely the eminent, established scientist who discovers such anomalies. Kuhn notes that "[a]lmost always the men who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change.19

Perhaps this is because the newcomers to the field have not developed the habitual presumption in favor of the teachers and texts which those who practice longer under a certain paradigm embrace. They do not allow their feelings for the authority to cause them to defer.

An additional reason also accounts for why the newcomers are almost always the ones to pursue paradigmatic shifts. This reason, like deference, relates to presumption. Whately argues that there is a class of presumptive ground for and against the learned:

> Again, there is . . . a presumption (and a fair one,) in respect of each question, in favour of the judgment of the most eminent men in the department it pertains to;--of eminent physicians, e. g. in respect of medical questions,--of theologians, in theological, &c.20

With respect to science, obviously, there is a presumption in favor of eminent scientists. Laymen, especially, presume

that these learned men have the most expertise; and other scientists with less influence will often ascribe presumption to those with more experience (i. e., those who are more learned) even though the "young upstart" who has uncovered a novelty might seem to have uncovered something significant.

But another of Whately's concepts about presumption becomes important with respect the "the learned". Whately indicates that sometimes presumption will be overthrown by an equally plausible counter-presumption. When this happens, the original presumption is overthrown and the argumentative ground shifts. In the present example, the presumption in favor of learned men can be rebutted by a counter-presumption against the learned. Whately explains the two ways in which counter-presumption against the learned operates:

> . . . there is a counter-presumption, arising from the circumstance that men eminent in any department are likely to regard with jealousy any one who professes to bring to light something unknown to themselves; especially if it promises to supersede, if established, much of what they have been accustomed to learn, and teach, and practice.21

> There is also this additional counter-presumption against the judgment of the proficients in any department; that they are prone to a bias in favour of everything that gives the most palpable superiority to themselves over the uninitiated, and affords the greatest scope for the employment and display of their own peculiar acquirements.22

The first instance of counter-presumption revolves around jealousy and fear; the second instance centers on the bias which is likely to result when learned men feel threatened. Again, Whately's concepts account for what happens in paradigm controversies, as Stephen Littlejohn illustrates: "Often during the years when a new theoretical approach is being formulated, theorists who support the old approach become defensive, protecting their many years or entire lifetimes of work that may be at stake."[23] This defensiveness and protectiveness is enough to establish a counter-presumption against the eminent scientists on either or both of the levels stipulated by Whately.

It may take time, however, for others to recognize the counter-presumption. In the meantime, presumption in favor of existing institutions and against a paradox, as well as deference and presumption in favor of the learned, will likely operate to demarcate the grounds for the controversy. These presumptive grounds will later shift once a new paradigm is adopted. It is up to the advocate of paradigmatic shift to overthrow presumption and establish a counter-presumption.

The advocate will accomplish this once he or she establishes a compelling case (based on novelty) for scientific revolution. Kuhn defines 'scientific revolution' in this way:

> [W]hen . . . the profession can no longer evade anomalies that subvert the existing tradition of scientific practice--then begin the extraordinary investigations that lead the profession at last to a new set of commitments, a new basis for the practice of science. The extraordinary episode in which that shift of professional commitments occurs are . . . scientific revolutions. They are the tradition-shattering complements to the tradition-bound activity of normal science.24

A noteworthy feature of Kuhn's definition is his references to existing tradition. In essence, Kuhn recognizes that there is presumption in favor of existing institutions. This direct parallel between Kuhn and Whately is even more pronounced in his comparison of political revolution to scientific revolution:

> Political revolutions are inaugurated by a growing sense . . . that existing institutions have ceased adequately to meet the problems posed by an environment that they have in part created. In much the same way, scientific revolutions are inaugurated by a growing sense . . . that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way. In both political and scientific development the sense of malfunction that can lead to crisis is prerequisite to revolution.25

Kuhn's reference to the concept of crisis with respect to how new paradigms overcome the presumptive ground occupied by old ones is important: before a new paradigm can take hold, the discovered novelty must create an exigence in the old one. This exigence then grows to the crisis stage, since the practice of normal science does not provide a way to account for the anomaly. When this happens, "crisis

loosens the rules of normal puzzle-solving in ways that ultimately permit a new paradigm to emerge.[26] So in addition to discovering anomalies in fact or theory which cannot be assimilated into an existing paradigm, scientific revolution is dependent on the development of a crisis as "a necessary precondition for the emergence of novel theories."[27]

Even at this crisis stage in a paradigm controversy, however, the advocate is not free of a presumptive advantage in favor of the existing paradigm. As Kuhn points out, "[e]ven in the area of crisis, the balance of argument and counterargument can sometimes be very close indeed. And outside that area the balance will often decisively favor the tradition."[28] Presumption, in these cases, acts as a decision rule, to the extent that unless there is a preponderance of argument in favor of rejecting an existing paradigm, those who must decide which paradigm to follow will adhere to the old research tradition.

It is easy to see that there are a multitude of factors working against the adoption of new paradigms. That is why paradigmatic shifts are fairly rare. Nevertheless, they do occur, and when they occur there is a direct substitution of one paradigm for another. Scientific research cannot take place in a theoretical vacuum; therefore, "[t]he decision to reject one paradigm is always simultaneously the decision to accept another."[29] Thus, the process of normal scientific

research begins anew, under the rubric of the recently adopted paradigm.

After Paradigmatic Shift

The concept of counter-presumption was introduced earlier with respect to presumption for and against the learned. This concept becomes operative on a larger scale in the post-paradigmatic shift phase of a scientific controversy. In his initial explanation of counter-presumption, Whately remarks that "[w]hen any science or pursuit has been unduly and unwisely followed, to the neglect of others, and has even been intruded into their province, we may presume that a re-action will be likely to ensue . . . ."[30] Just as there were direct parallels between Kuhn's and Whately's recognition of presumption in favor of existing institutions, so there are also direct parallels in this instance: Whately predicts a reaction to scientific practice (i. e., normal scientific research) which neglects to recognize that it is on the wrong track, so to speak. This reaction, in Kuhn's terms, is a shift in paradigms which leads to scientific revolution.

The result of paradigmatic shift is a corresponding shift in presumption. Since rejection of one paradigm necessitates acceptance of another, the new paradigm will be ascribed a counter-presumption; then, after it has been so ingrained into the practice of normal science that it has

completely replaced the old, it will be ascribed (by attrition of the old paradigm/presumption) natural presumption. It will cease to be a reaction to an existing presumption and it will become the 'existing institution.' Whately provides an example of the evolution from counter-presumption to presumption in the field of religion:

> Accordingly there was a Presumption against the Gospel in its first announcement. . . .
> Now the case is reversed. Christianity exists; and those who deny the divine origin attributed to it, are bound to show some reasons for assigning it to a human origin. . . . The Burden of proof, now, lies plainly on him who rejects the Gospel 31

It is important to understand that the process of paradigm-shift, as well as the process of presumption-shift, does not happen instantaneously. Because of the deference and the professionalization inherent in the scientific community, advocates of paradigmatic shift gain adherents to their position incrementally: "When, in the development of a natural science, an individual or group first produces a synthesis able to attract most of the next generation's practicioners, the older schools gradually disappear."32 It takes a long time to develop the equipment, language, textbooks, teachers, etc., which are part of the professionalization of normal science. Dramatic changes do occur right away, but there is a lag time between the change in theoretical outlook and attendant changes in the practice of science. For instance, "[w]hen it repudiates a past

paradigm, a scientific community simultaneously renounces, as a fit subject for professional scrutiny, most of the books and articles in which that paradigm had been embodied."[33] It must be stressed again, however, that repudiation of a past paradigm does not happen instantly. The advocate, strong in his or her conviction that the paradigm should guide research, seeks to enlighten the collective understanding of the scientific community and persuade them to adopt the new outlook. At that point,

> [I]f the paradigm is one destined to win its fight, the number and strength of the persuasive arguments in its favor will increase. More scientists will then be converted, and the exploration of the new paradigm will go on. Gradually the number of experiments, instruments, articles, and books based upon the paradigm will multiply. Still more men, convinced of the new view's fruitfulness, will adopt the new mode of practicing normal science, until at last only a few elderly hold-outs remain.[34]

Paradigmatic shifts are the driving force behind scientific revolutions. And committed (often young) scientists are the driving force behind paradigmatic shifts. These scientists know that in order to win the battles in which they are engaged as "revolutionaries," they must convince the larger scientific community that the subversive paradigm which they espouse should replace the obsolete one. The advocates have a number of persuasive tools at their disposal, just as do any advocates; but it is important that their reasoned discourse be especially mindful of their burden of proof, since there will be overwhelming

presumption against paradigmatic shift. In order to secure a shift in paradigms, they must meet their burden to prove that the novelty which they discover cannot be assimilated into the existing paradigm. They must further demonstrate that the anomaly carries with it enough significance to lead to crisis and justify conversion to the new paradigm. Finally, they must establish a counter-presumption against the existing paradigm and its current practitioners (against the learned) if they are to gain adherents to their position. It is clear, then, that paradigmatic shifts are accompanied by, assisted by, and accounted for by presumptive shifts.

Notes

[1]Thomas S. Kuhn, The Structure of Scientific Revolutions (Chicago: Univ. of Chicago Press, 1970), p. 200.

[2]Kuhn, p. 204.

[3]Douglas Ehninger, "Editor's Introduction," in Elements of Rhetoric, by Richard Whately (Carbondale, IL: Southern Illinois Univ. Press, 1963), p. xiii.

[4]Kuhn, p. 10.

[5]Kuhn, p. 10.

[6]Kuhn, p. 11.

[7]Kuhn, p. 64.

[8]Kuhn, p. 64

[9]Richard Whately, Elements of Rhetoric, ed. Douglas Ehninger (Carbondale, IL: Southern Illinois Univ. Press, 1963), p. 112.

[10]Whately, p. 114.

[11]Whately, p. 115.

[12]Kuhn, p. 5

[13]Whately, pp. 128-129.

[14]Sharon Dee Downey, Toward a Theory of Rhetorical Genre, Diss., Univ. of Colorado at Boulder, 1983 (Ann Arbor, MI: Univ. Microfilms International, 1984), p. 128.

[15]Whately, p. 118.

[16]Kuhn, p. 80.

[17]Kuhn, pp. 10-11.

[18]Kuhn, p. 166.

[19]Kuhn, p. 90.

[20]Whately, p. 128.

[21]Whately, p. 128.

[22]Whately, p. 128.

[23]Stephen W. Littlejohn, Theories of Human Communication (Belmont, CA: Wadsworth Publishing Co., 1976), p. 15.

[24]Kuhn, p. 6.

[25]Kuhn, p. 92.

[26]Kuhn, p. 80.

[27]Kuhn, p. 77.

[28]Kuhn, p. 157.

[29]Kuhn, p. 77.

[30]Whately, p. 126.

[31]Whately, p. 116.

[32]Kuhn, pp. 18-19.

[33]Kuhn, p. 167.

[34]Kuhn, p. 159.

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